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The Extension of Selective Tests to Industry

By BEARDSLEY RUML

THAT modern warfare requires the mobilization of the industries of a nation has become a commonplace of our thinking. Scarcely less familiar is the notion that an army itself is in a very real sense an industrial unit,—industrial in that like industry it must meet and solve problems of fabrication, maintenance, transportation and distribution. Like industry, the army found the solution of these problems to depend to an important degree on the effective utilization of available skilled personnel, and in order that jobs requiring men with special qualifications might be acceptably filled, the army created within itself a body with functions like that of the employment manager of industry, that is, functions of bringing man and job together with due regard to the qualifications of the former and the demands of the latter.

The problem of bringing jobs and men together fell naturally into two main parts, one related to the job, the other to the man. Concerning the job it was necessary to discover just how many men of specific skilled occupations should be distributed to each military unit, and further to state the qualifications that the name of each occupation implied. For example, considerable difference of opinion existed on the duties of a wagoner,—does he make wagons, repair wagons, or does he drive them? The study of army jobs yielded first, the *Tables of Occupational Needs* which specify the skilled complement of military units, and second, the *Trade Specifications and Occupational Index* which describe the qualifications that are implied by army trade names.

Concerning the man, it was necessary to find out his physical, mental, educational and technical qualifications and to make the record of these qualifications instantly available for use. This record which was prepared for practically every man in the army was known as the *Qualification Card*. It is evident that the whole scheme of fitting man to job depended for its success on the accuracy of these records, and consequently some interest attaches to the methods by which the qualification card of each individual

was prepared, and to the ways that similar methods might be used in industrial placement.

In determining the qualifications of men coming into service, the army used the physical examination, the interview, the intelligence test and the trade test. The interview and the physical examination are familiar devices to the employment manager, and so, although there are many points of interest connected with the use of these methods in the army, little more will be said about them here. The intelligence test and the trade test are probably more novel; certainly they have not come into general use as yet in industry.

The army intelligence tests were devised and used by the army so that information concerning each man's mental alertness might be at hand to aid in assigning him to duty. The actual form which the tests took was determined to a large extent by several aspects of the army situation. In the first place the tests had to be given with great speed. It was not uncommon to test and to report on 2,000 men within a space of twenty-four hours in a single camp. In the second place the tests were scored by a staff that was of necessity continually changing. And finally the method of testing had to be so adapted that men who could not speak or read English might be satisfactorily rated.

To meet this situation a system of three tests was in use: first, a test for men who could read English, a test so constructed that it could be given to groups of as many as 500 individuals at one time; second, a test which could be given by the group method to men who could not read English; and third, tests which were given to men individually to establish the fact of mental deficiency or to give a clue to abnormal mental conditions. The individual tests were used primarily for those men who gave an indication of mental defect in the group tests or for men who were sent by commanding officers for special examination.

The group tests were eight-page pamphlets, a test to a page. The tests were so prepared that it was unnecessary for the soldier to write a word during the entire test, the responses consisting entirely of digits, of check-marks, and of underscoring words already printed in the test. The group test for those who could not read English could be administered wholly without the use of language by means of charts and gestures.

As a result of these tests each man received a rating: A for the very superior; B for those decidedly better than the average; C+, C, and C— for those of average ability; D and D— for the inferior; and E for those who did so poorly in the test that arrested mental development was suspected. Whenever mental defect was indicated, confirmation was always sought through individual examination. The letter indicating the class which a man achieved was posted at once to his qualification card, and this information was then used in assigning him to duty in the army.

The ratings of mental alertness were useful in three ways. In the first place they indicated those individuals of such inferior mental ability that their presence in a unit would retard training to a prohibitive degree, men who might even become a menace to the unit in critical situations. Such men were either assigned to routine tasks which they were competent to perform or they were discharged from the army. In the second place, the ratings showed men of superior grade who might be considered for advancement. They pointed out to a commanding officer certain individuals for his special observation, sometimes with startling results. In the third place, the ratings were used to equalize the alert and the sluggish in the companies of a regiment. It was found that if men were assigned to companies in a hit or miss fashion so far as mental ability was concerned, some companies of the regiment could be trained with great speed while the training of others seemed impossible. It was found that these differences were paralleled by differences in the average ratings of the companies, and after shifts in personnel were made which equalized the average intelligence ratings, the training of the regiment as a whole proceeded in a decidedly more satisfactory way.

The intelligence tests have demonstrated their value as an instrument for placing men in the army. On what basis were these men placed? What is the mental trait that the tests measure? A bulletin published authoritatively states that "the rating a man earns furnishes a fairly reliable index of his ability to learn, to think quickly and accurately, to analyse a situation, to maintain a state of mental alertness, and to comprehend and follow instructions." This is what is popularly called mental ability or general intelligence. We may safely say that mental ability is

one of the qualifications that needs to be scrutinized in placing men in the army; and that the army intelligence tests have measured this trait with sufficient accuracy to make them of real military value.

The uses made of intelligence tests in the army suggest that similar tests might be of considerable value to industry. The first use that at once suggests itself is in relation to hiring. Mental alertness is clearly an attribute that brings about success or failure at different kinds of work, and the employment manager who will inform himself of the amount of intelligence that various jobs require can assure himself that each applicant is at least intelligent enough so that he will suffer no handicap in becoming a satisfactory employe because of a slow or retarded mentality. The converse is also true, that applicants of superior intelligence need not be hired for positions in which high mental ability may be either unnecessary or misdirected.

The usefulness of intelligence ratings only begins with the hiring of the applicant; they may be of considerable importance in readjustments in the working force itself. Clearly in slack times when the laying off of groups of men becomes imperative, care might be taken that mental ability in its relation to productivity be given its proper weight in deciding which individuals shall stay and which shall go. In conditions where the manufacture of a new product involving new processes and technical operations is begun, those men on the present force whose mental alertness gives indication of quick adaptability to new work and unfamiliar situations might be selected. When it is desired to select or to encourage certain of the less skilled operators to study in the company's technical schools, better results would be obtained by choosing those whose intelligence rating gives promise of quick learning and an appreciation of the advantages of special training.

The practical applications of intelligence tests so far mentioned are perhaps fairly obvious. A further use, somewhat less certain of immediate value, is suggested from the value of army intelligence tests in balancing the companies of a regiment. Suppose care were taken to keep the various operative units of an industry well balanced, not equally balanced but balanced in the sense that each operative unit consist of individuals of proper intelligence for the job. This means shifting the mentally slow

from positions involving quick judgment, adaptability and mental resourcefulness; it means also removing the mentally alert from work that is of a dull routine nature, unvarying, tedious, calling in no way for the full exercise of the capacities of an intelligent workman. It is conceivable that such balancing would not only be profitable from the point of view of immediate production, but that a major cause for industrial unrest and discontent would be attacked. Certainly the mentally slow derive little but worry and uneasiness from work that lies beyond their power of intellectual adjustment; certainly also the mentally alert feel the futility of jobs that are lacking in creative interest for them.

Great care must be taken to make sure that any intelligence test proposed for use in industry is really able to do the work expected of it. There is danger that inexperienced enthusiasts, wholly unconscious of test technique and test limitations, will offer broadest panaceas for all the difficulties of mental measurement. It should be remembered that the army intelligence tests measure general mental ability, not specific mental traits. It should also be borne in mind that the success of the army tests was due to the great range of mental ability received by the army. Parallel results have never been achieved where tests have been used as a selective agency on a group of relatively small intellectual range. Further, the army tests determined as they were by the fixed conditions of military affairs are probably not the most satisfactory kind of tests for industrial use. It is impossible to go into detail in the discussion of pitfalls;—the purpose here is only to warn the industrial manager who is inclined to see a use for intelligence ratings in his industry that all which savors of dogmatism, inexperience and charlatanism should be avoided in this very difficult phase of employment work. So much for the intelligence tests.

The army trade tests are quite a different story. Among the various items which were recorded on each soldier's qualification card were the very important ones concerning his occupation in civil life and his proficiency in these occupations. The information on these points was at first extracted by means of an interview. It was soon discovered that the interview was unreliable, not hopelessly so by any means, but just unreliable enough to give cause for trying to improve the system. The reason for the in-

accuracy was not lack of training on the part of the interviewer; it was rather the weakness that inheres in the best conducted of interviews. Soldiers, like all men, are unable to judge accurately of their own ability; sheer mendacity was fairly prevalent, especially when there was a tip that this trade or that was required in France; and honest misunderstandings were frequent. An amusing case is that of a carver of Meerschaum pipes who was assigned to work on a sewer at one of the camps. His qualification card showed him to be a "pipe cutter" and he had been classified as a plumber.

Trade tests seemed to be a way of bettering the situation, tests that would check up a man's statement of what his occupations were in civil life and of what he claimed his skill to be. As in the case of the intelligence tests, trade tests had to fit into the army scheme of things. This meant that they had to be given in a short time, not to average more than ten minutes per test, that they be given by examiners who might have no knowledge of the trade whatever, and that they require none of the expensive machinery and equipment that is the complement of most trades. Aside from these requirements imposed by the military situation in which the tests were to be used, it was imperative that the tests give bona fide measures of occupational skill, and that they give these measures in such a way that a journeyman plumber would be rated a journeyman plumber no matter from what part of the country he came or to what camp he happened to have been sent. Uniformity of rating from camp to camp was absolutely essential.

Army trade tests were devised to meet these conditions. Doubt that such tests could be made is frequently expressed by people who know the difficulties of estimating trade ability and of securing uniformity of rating from different examiners. In preparing a test for a trade, the trade was analyzed, not merely to find out the kinds of jobs that are done, but also to discover bits of information that might be peculiar to the trade and to pick up characteristic terminology that might be diagnostically significant. The elements of information, judgment and skill which were discovered by this analysis were then put into a form that could be administered and scored by an examiner, unskilled in the trade but trained to test; they were then tried out on apprentices, journeymen and experts who were actually on the job in industry. Novices were

also examined to make sure that a score could not be made through high intelligence in the absence of trade skill. More than a hundred persons were tested in the preparation of every test. As a result of this try out, the elements which had the highest diagnostic value in detecting trade ability were selected and put in the form of an army trade test. Since each element could be scored, a total score in the test could be found by adding up the points made on the elements. The degree of trade ability could be accurately inferred from the total number of points scored in the test.

Army trade tests have been of value in determining the skill of men professing to be tradesmen. They have indicated technical ability in such a way that uniformity of rating was gained in all the camps where trade tests were used. The trade test rating was the basis for a soldier's assignment to duty requiring specific trade qualifications; it was the basis for choosing which men should be sent from one camp to another to make up shortages of skilled personnel. Entire organizations have been torn to pieces and rebuilt as a result of information gained through trade tests. This was true especially when requisitions calling for skilled men for immediate duty overseas ordered that these men be trade tested before they were sent. The army trade test has thus been successful in its determination of technical qualifications which were to be the basis for military assignment.

Several applications of the trade test method to industry are suggested from its uses in the army. The three phases of employment work that seem most immediately concerned are hiring, transfer and training. Trade tests have an immediate and obvious use in industry in aiding in the selection of new employes. They are the natural method of securing very essential occupational information, of ascertaining whether this particular applicant really has the skill that his age, experience record and last wage seem to indicate. Certainly a direct method of measuring trade ability is to be preferred to an indirect method of inferring it.

Since trade tests can be constructed which will measure proficiency in the various activities that are commonly implied by the name of an occupation, they would be valuable in all matters involving shifts in the working force. A knowledge of each man's strengths and weaknesses within the broad range covered by his

trade would make more intelligent and less uncertain the transfer of particular men to different work. The trade test rating should also be one factor in determining which workers should be retained in dull periods, for the nucleus that is left in the industry after the cut is made is the corner-stone of the new operative unit. It is important to know that from the technical side the stronger elements of the old unit are included in this foundation.

The information that would be given in the trade test record is intimately connected with the educational program of an industry. Isolated weaknesses in the chain of an individual's technical strength may be removed. Furthermore, a systematic program directed to prevent stagnation on the job would give to industry an increasingly flexible and effective working force and would give to the worker the pride in his skill which comes from watching its continuous growth.

A further suggestion comes from the fact that standardized trade tests have been producing uniform ratings of ability for the army, ratings that were equivalent in all parts of the United States. If, through the use of tests, such uniformity of evaluation can be gained from place to place, so also can it be gained from month to month. Trade tests thus offer a means of securing fixed standards of technical proficiency which signify the same thing in December that they did in June. Such standards can be used in specifying definitely the degree of skill required in various positions, and in assuring that employes who are taken on from time to time measure up to this fixed standard. An unchanging scale in terms of which degrees of ability can be stated would also make possible the determination of the sum total ability in the working force of an industry. Such an evaluation of available skill would reduce one of the intangible assets of business to a tangible one, with consequent increase in the significance of all thinking involving this phase of industrial fact.

Again the warning against the amateur must be sounded. Not even the trade tests used so successfully in the army are capable of yielding the results pictured above. Only through experimentation will the ultimate goal be reached. Army trade tests have done their part in pointing out the way which may be followed.

The intelligence tests and the trade tests are part of one technique. Both have for their function the measurement of phases of

human qualifications that are vitally important in the selection of employes, in their assignment to work, in their transfer from department to department, and in further education and training. The intelligence test gives a rating of general mental ability; the trade test gives a rating of specific technical skill. The two together picture an individual's status in those traits which most definitely condition his effectiveness in industry.

In the army, the tests have been used to supply jobs with proper men; the placing of the individual man as such was not and could not be the matter of immediate attention. Yet because of the fact that selection was based on qualifications, on this point the general confidence of the rank and file was achieved. So also in industry a scheme that promotes the utilization of men on work for which they are fitted will result in increased productiveness of the shop and increased contentment of the working force. Intelligence tests and trade tests give promise of becoming methods of considerable importance in our industrial life. The army has accepted the employment methods of industry and has pushed ahead; industry will ultimately receive whatever of this advance proves in practice to be real progress.